Plating Emissions

November 2020

Table 1 lists uncontrolled emission factors for hexavalent chromium (Cr+6), nickel (Ni), cadmium (Cd) and total particulate matter (PM). The factors are provided in pounds per 1000 ampere-hours. **Table 2** lists the certified wetting-agent chemical fume suppressant with usage restrictions to meet 0.01 milligram per ampere-hour limit (or 0.000022 lb/1000 ampere-hr). Table 3 lists emission factors for hexavalent chromium (Cr+6), nickel (Ni), cadmium (Cd) from heating. **Table 4** provides the control efficiencies for various add-on control devices. If your process is controlled with a combination of up to 3 control methods, you are allowed to apply the control efficiency (CE) additively **except for High Efficiency Particulate Arrestor (HEPA)filter and higher efficiency filters** as follows:

$$\text{Overall CE} = 1 - [(1-CE_1) \times (1-CE_2) \times (1-CE_3)]$$

The maximum control efficiency for any combination of control methods is 99.999% or at the certified efficiency of the HEPA or Ultra Low Particulate Air (ULPA) filter. If your process is controlled by more than 3 control methods, please contact the **Help Hotline** at (909) 396-3660 for assistance. The emission factors and control efficiencies given in Tables 1, 2, 3 and 4 are, in the absence of facility-specific data (i.e., permitting information), intended for reporting emissions under the consolidated Annual Emission Reporting program **only**. For emission factors or control efficiencies associated with permit applications, please consult with permit processing engineers for specific instructions regarding control methods and control efficiencies.

It is expected that many facilities have greater levels of control; therefore, facilities are encouraged to use emission factors specific to their operations. Please provide supporting documentation for your emission factors. **If any of your plating processes has a district-approved source test, then use the emission factors developed from the source tests for calculating emissions.**

Table 1. Uncontrolled Emission Factors for Plating Operations

Toxic Compound / Process	Emission Factor, (lb/1000 ampere-hr)	
	Toxic Metal	Total PM [5]
Hexavalent Chromium (Cr^{+6}) / Plating [1]	0.0097	0.020
Nickel (Ni) / Plating [2]	0.00051	0.0011
Cadmium (Cd) / Plating [3]	0.0057	0.012
Cadmium / Rotating Barrel Plating [4]	0.000020	0.000041

[1] Estimated from the equation,

$$EF = 0.505(w)(100-N)$$

where, EF = emission factor in mg/amp-hr,
w = weight fraction of hexavalent chromium in solution, and
N = plating efficiency in percent

The representative chrome plating bath contains a chromic acid of 32 to 34 oz/gal, which equates to a weight fraction of approximately 10.9%. The assumed plating efficiency is 20%. EF = 4.4 mg/amp-hr = 0.0097 lb/1000 amp-hr.

[2] SCAQMD and Metal Finishers Association of Southern California, 1998 (Source Test No. 98-109 through 111)

[3] AP-42 Table 12.20-4, July 1996.

[4] SCAQMD (Source Test No. 02-0192)

[5] Assumes that 48% of particulate matter consists of the toxic metal. The relationship is derived from Table 12.20-1 of AP-42 dated July 1996 for plating operations with add-on control equipment.

Table 2. Certified Wetting-Agent Chemical Fume Suppressants Companies, and Usage Restrictions for Hexavalent Chromium Electroplating and Chromic Acid Anodizing Operations

Product	Company	Usage Limitations (measured by Stalagmometer)	Controlled Emission Factor (lb/1000 ampere-hr)	
			Hexavalent Chromium [1]	Total PM [2]
Fumetrol 21 LF2	Atotech USA	Shall be used at or below 30 dynes/cm for Hard Chrome Plating	0.000022	0.000045
HCA-8.4	Hunter Chemical LLC	Shall be used at or below 33 dynes/cm for Hard Chrome Plating Shall be used at or below 25 dynes/cm for Chromic Acid Anodizing and Decorative Chrome Plating	0.000022	0.000045
Macuplex STR NPFX	MacDermid Enthone	Shall be used at or below 32 dynes/cm for Chromic Acid Anodizing and Decorative Chrome Plating	0.000022	0.000045
Dicolloy CRPF	ProCom LLC	Shall be used at or below 32 dynes/cm for Chromic Acid Anodizing and Decorative Chrome Plating	0.000022	0.000045

[1] Rule 1469(l) requires the owner or operator of a chromium electroplating or chromic acid anodizing tank currently using a wetting agent chemical fume suppressant to use a South Coast Air Quality Management District (South Coast AQMD) certified chemical fume suppressant. This table lists the certified non-PFOS chemical fume suppressants that have been tested and certified by South Coast AQMD and California Air Resources Board (CARB) to meet an emission limitation of 0.01 milligrams of Cr+6/ampere-hour (or 0.000022 lb/1000 ampere-hr) of applied current at the stated surface tension.

[2] Assumes that 48% of particulate matter consists of the toxic metal. The relationship is derived from Table 12.20-1 of AP-42 dated July 1996 for plating operations with add-on control equipment.

Table 3. Uncontrolled Emission of Hexavalent Chromium-containing tank from heating

Temperature Range (F)	Emissions Factors [1] (lb/hr-ft^2-%Cr+6)
>140 to ≤ 150	0.000000249
>150 to ≤ 160	0.000000657
>160 to ≤ 169	0.00000105
>169 to ≤ 188	0.00000143
>188	0.00000492

[1] Multiply the indicated value for the appropriate temperature range by the tank's liquid surface area in square feet and by the hexavalent chromium concentration in weight percent to determine the emission rate in pounds of Cr^{6+} per hour.

[2] The calculation is based on the duration the tank is at elevated temperature, not the amount of time the tank is used to process parts or the amount of time the heater/thermostat is "on."

[3] Unless and until additional empirical is obtained and approved, this table can also be used to determine heated tank emissions of other metals (e.g., nickel, cadmium) by multiplying the indicated value by the atomic weight of the metal of interest and dividing by the atomic weight of chromium.

[4] This table is subject to change upon the development and approval of additional empirical data.